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OPERATING EXPERIENCE WEEKLY SUMMARY

Office of Nuclear and Facility Safety

July 2 - July 8, 1999

Summary 99-27

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Table of Contents

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EVENTS

1. ACID FROM DRÄGER® TUBE BURNS EMPLOYEE

On June 30, 1999, at the Argonne National Laboratory—West, an employee performing an oil vapor test on a breathing air system was burned by concentrated sulfuric acid expelled from a Dräger tube. The employee received burns to the right side of the neck, the right forearm, and the little finger of the left hand. He and a co-worker ran to an adjacent building and began a 15-min water wash of the burned areas. The co-worker drove the employee to the site dispensary, where he showered for another 15 min. Site safety and health personnel transported the employee to a regional medical center, where he was treated and released with the recommendation to follow up with a physician. Exposure to the acid caused the skin to redden and blister. (ORPS Report CH-AA-ANLW-ANLW-1999-0005)

The employee was sampling air from a newly installed branch of the breathing air system for water vapor and oil vapor. The procedure consists of connecting an air test instrument (pressure reducer and flow meter) and applicable Dräger tubes to the air source. The employee had completed the water vapor test and was performing the oil vapor test. This test uses a Dräger Oil 10/a-P tube, part number 6728371 (Figure 1-1). The tube contains a glass ampoule of concentrated sulfuric acid and a length of indicator material inside a glass outer tube. In use, both fused ends are snapped off the outer tube, the tube is placed in the air test instrument, and a metered quantity of air is forced between the acid ampoule and outer tube and through the indicator material. A reading is obtained by snapping the outer tube in the area between two dots to break the ampoule. The acid is shaken down into the indicator material, and the extent of discoloration of the indicator material is proportional to the amount of oil adsorbed by it. A length of shrink tubing around the central portion of the Dräger tube is intended to contain the sulfuric acid.

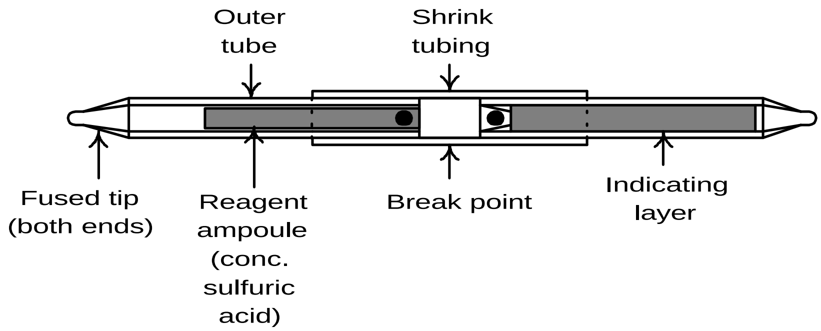

Figure 1-1. Dräger Oil 10/a-P Indicator Tube

Dräger Oil 10/a-P tubes have been used at the Argonne National Laboratory—West for about 15 years without incident. Laboratory personnel checked with safety and health personnel at another site, who reported more than ten years of use without incident. The injured employee reported that he has probably performed this test more than a hundred times. Neither the Dräger product literature nor the material safety data sheet requires personal protective equipment when using the tubes; they caution only against possible cuts from glass shards.

Laboratory personnel double-bagged the broken tube and took it to an on-site analytical laboratory for examination. The distance traveled by the acid indicates that it was expelled under pressure. The moisture sample taken just before the oil sample contained more than 450

mg/m^3 of water vapor, and laboratory personnel believe that the acid may have reacted exothermically with moisture introduced with the sample, providing the energy to expel the acid.

Experience with Dräger Oil 10/a-P tubes has shown that they are generally safe. However, personnel who use them can take the following actions to further reduce the risk of injury.

- Break the tubes in a direction away from themselves and others.
- Consider breaking the tubes inside a short length of thin-walled polyethylene tubing.
- Perform water vapor samples and correct moisture problems before performing oil vapor tests.
- Consider wearing eye protection and gloves when handling the tubes.

KEYWORDS: acid, burn, injury, sampling

FUNCTIONAL AREAS: Operating Experience

2. FIRE SUPPRESSION SYSTEM INADVERTENTLY ACTUATED

On June 28, 1999, at the Los Alamos Plutonium Processing and Handling Facility, a facility supervisor inadvertently actuated the fire suppression system while attempting to reset a supervisory trouble alarm on a fire alarm panel. The fire system injected water into several exhaust plenums for approximately 6 sec before the initiation signal cleared and the fire suppression system deactivated. Approximately 5 gal of water was injected into each of the affected plenums. None of the plenums suffered any damage and no contamination was spread. This occurrence is significant because corrective actions implemented following a similar occurrence at the facility in 1998 were unable to prevent this inadvertent actuation. (ORPS Report No. ALO-LA-LANL-TA55-1999-0037)

On June 28, the central alarm station (CAS) received a supervisory trouble alarm from a building fire alarm panel. The CAS dispatched a fire system specialist (called a facility supervisor) to investigate the alarm. The facility supervisor located the fire alarm panel and unsuccessfully attempted to reset the alarm. Without informing the operations center operator, he de-energized and re-energized the panel to clear the supervisory trouble alarm. When power was restored to the fire alarm panel, all of its zone fire alarms actuated and rang into the facility control system (FCS). Although there was no fire, the FCS interpreted the alarms as real and actuated the fire suppression system. Water was injected into exhaust plenums which, during an actual fire, cool hot exhaust gases before they enter high efficiency particulate air filters. Facility personnel who subsequently inspected the plenums estimated that there was approximately 5 gal of water in each of the plenums, but they do not believe the water caused any problems or posed any risks.

A standing order in effect at the time of the occurrence instructed personnel to place the FCS in the monitor mode before testing the fire alarm panel or performing maintenance on it. In this mode, the FCS monitors and indicates alarm conditions but does not actuate the associated fire system in response to alarm signals. At the post-occurrence critique, investigators learned that facility managers have not proceduralized the response to fire system trouble alarms and rely instead on skill-of-the-craft. Investigators also determined that the facility supervisor did not clearly communicate his complete troubleshooting plan to the operations center. They concluded that although the operations center operator was aware of the standing order, he did not realize that the facility supervisor would engage in activities that required the FCS to be placed in the monitor mode, nor did he believe it would be necessary to communicate further with the CAS.

Facility managers had issued the standing order in response to an event that occurred on March 9, 1998. (Weekly Summary 98-11; ORPS Report No. ALO-LA-LANL-TA55-1998-0007). In that event, a sprinkler head for the demister spray in a ventilation exhaust duct inadvertently actuated and sprayed water into the ductwork for approximately 4 sec and released approximately 2 gal of water into the exhaust duct. There was no release of contamination and no fire at the time of the inadvertent actuation. Investigators learned that maintenance personnel had de-energized the fire alarm panel to replace a defective battery charger. After installing the new battery charger, they re-energized the fire alarm panel, which initiated false heat detector alarms from nearly all fire zones. The fire alarm panel did not transmit alarm signals to the fire station because the panel was still in the maintenance mode of operation. However the FCS interpreted the signals from the heat detectors as a genuine fire condition and actuated the demister spray in the cool-down box of the exhaust plenum. Two corrective actions were developed as a result of the March 1998 occurrence: (1) the facility manager issued a standing order to the operations center operators instructing them to place the FCS in the monitor mode before conducting tests or maintenance on the fire detection and alarm systems and (2) a request to upgrade the fire alarm panels was submitted in 1998. Funding was approved on June 6, 1999, and the replacement is scheduled during fiscal year 2000.

NFS has reported on other events in the Weekly Summary in which fire suppression systems were inadvertently actuated or lessons were not learned, resulting in a repeat occurrence. Following are some examples.

- Weekly Summary 99-19 reported that a fixed, dry-chemical fire suppression system inadvertently discharged into a three-compartment transportainer at Sandia National Laboratory—Albuquerque 90 min after a contractor had performed a semiannual inspection and maintenance of the suppression system. Investigators learned that the contractor did not fully cock the fire suppression system arming mechanism, leaving it in an unstable condition that caused the inadvertent discharge. (ORPS Report No. ALO-KO-SNL-NMFAC-1999-0005)

- Weekly Summary 99-16 reported that on February 12, 1999, freezing water in a wet-pipe fire suppression system at the Los Alamos Chemistry and Metallurgy Research facility caused a sprinkler head to break at a piping elbow. The flow of water from the damaged line actuated a fire alarm. Fire department personnel isolated the leak and the damaged line was repaired. A similar event had occurred at the facility in 1997. An identical wet-pipe fire suppression line in the exhaust plenum on the roof froze, causing a sprinkler head to break and release water. In both events, exhaust fans that provided a supply of warm air into the plenums had been removed from service, and no precautions were taken by facility personnel to prevent freeze damage. One of the corrective actions ordered after the 1997 event was to implement a plan for developing and implementing a freeze protection program at the facility. At the time of the second occurrence, facility managers still had not developed and implemented a formal freeze protection program. (ORPS Reports ALO-LA-LANL-CMR-1999-0003, and ALO-LA-LANL-CMR-1997-0026)

- Weekly Summary 98-43 reported lessons learned from an event at the Idaho National Engineering and Environmental Laboratory in which a high-pressure CO_2 fire suppression system unexpectedly actuated in a building at the Test Reactor Area. The accident resulted in one fatality, several life-threatening injuries, and significant risk to the safety of the initial rescuers. Investigators determined the direct cause was the inadvertent operation of electric control heads, which released CO_2 into the occupied space without a discharge warning alarm. (Type A Accident Investigation Board Report on the July 28, 1998, Fatality and Multiple Injuries Resulting from the Release of Carbon Dioxide at Building 648, Test Reactor Area, Idaho National Engineering and Environmental Laboratory; ORPS Report ID--LITC-TRA-1998-0010)

- Weekly Summary 98-38 reported that a Halon system discharged while fire department personnel were performing a Halon system functional test at the

Hanford Site Plutonium Finishing Plant. Investigators determined that the discharge was the direct result of electricians disconnecting wires from a Halon tank pressure-monitoring device instead of a Halon discharge actuator. They also determined that personnel performed the work using a generic work package for preventive maintenance on site fire protection systems. Misidentifying actuator wires while conducting operability checks resulted in the inadvertent actuation of a fire suppression system. (ORPS Report RL--PHMC-PFP-1998-0040)

These events underscore the hazards associated with working on automatic fire suppression systems as well as the significance of an effective lessons learned program. The June 28, 1999, occurrence also illustrates the importance of proper communications between personnel during maintenance activities as well as the necessity for proceduralizing activities involving operations or maintenance on systems and equipment. Although facility management had issued a standing order to place the FCS in the monitor mode before testing the fire alarm panel, the lack of proceduralization and poor communications caused the actuation of the inadvertent fire suppression system.

KEYWORDS: communication, corrective actions, fire suppression, lessons learned, sprinkler, water

FUNCTIONAL AREAS: Fire Protection, Lessons Learned, Operating Experience

3. ELECTRICAL CABLE DUCT PENETRATED DURING DRILLING OPERATION

On June 23, 1999, personnel at the Yucca Mountain Site—Geographical Disposal determined that a 12,470-V ac backup feeder cable bank had been damaged by drilling operations to install ground rods for a lightning protection system. The installation required nine 4-in. holes drilled to a depth of approximately 11 ft. Facility personnel drilled one hole on May 28, 1999, and investigators believe that they penetrated and damaged the cable bank while they were drilling one of the remaining eight holes on June 1, 1999. Although this occurrence did not involve personnel injury, it is significant because it seriously threatened employee health and safety. (ORPS Report HQ--SAYM-YMSGD-1999-0007)

Work instructions called for driving vertical ground rods beside the structural steel members of a conveyor system. A craft supervisor marked the locations for the ground rod holes in accordance with vendor diagrams. Because the work instructions did not include layout drawings of underground utilities, craft managers requested the survey department to determine the location of underground utilities near the conveyor. However, the work crew proceeded with the drilling before this determination was completed.

The circuit breaker that supplies the damaged circuit was known to be operable on May 29, when electricians successfully reset it following an electrical storm. An electrician performing routine preventive maintenance on June 7 noticed and reported that the breaker was open. When electricians attempted to reset it on June 10, it would not close. Trouble flags indicated a ground fault on phase C, and a high-potential electrical test on June 18 revealed a direct short on phase C to ground.

By June 23, 1999, investigators had assembled enough information to determine that the cable had been damaged during the drilling operations. The facility manager has made the initial determination that work planners had not fully evaluated the work and its associated hazards before the start of work. He has ordered the following actions in response to this occurrence.

- All construction and general maintenance work has been suspended except for low-risk activities supporting scientific data collection, personnel and environmental safety, permit compliance, and emergency response capability.

- A team led by the safety and health manager and the regulatory and licensing group will conduct a thorough investigation of this near miss and its root causes. The team will be assisted by an outside consultant. Lessons learned will be identified, documented, and acted upon.

- Facility managers will examine activities that have been suspended to ensure that appropriate hazards analyses are in place, all work authorization documentation is complete, and appropriate training and other corrective actions have been completed.

- Activities will be restarted only with the review and concurrence of operations and maintenance (O&M) managers.

The ORPS database contains several examples where weaknesses in work planning and control have contributed to excavation, trenching, or drilling occurrences. The following are among them.

- On May 13, 1998, at the National Renewable Energy Laboratory, a contractor excavating with a track hoe struck and damaged an energized underground 13-kV ac utility line. Investigators determined that the equipment operator had begun excavation without verifying that the utilities location process was complete. The job site supervisor did not ensure that utilities had been located before work began, and the operator's direct supervisor assumed that the absence of ground markings indicated the absence of buried utilities. (ORPS Report GO--NREL-NREL-1998-0001)

- On April 1, 1998, at the Los Alamos National Laboratory Accelerator Complex, a backhoe operator snagged a 208-V ac electrical cable and two communications lines during excavation for a construction project. The drawings used by the construction crew did not show the three lines, but newer drawings were available that did show them. Although the crew requested the most recent drawings, they did not receive them before they started work. (ORPS Report ALO-LA-LANL-ACCCOMPLEX-1998-0006)

- On December 29, 1997, electricians at the Fernald Environmental Management Project On-Site Disposal Facility had installed grounding rods for a construction boundary fence using a penetration permit that was issued to another subcontractor to install fence posts. Electrical subcontractors thought that the penetration permit issued to the fence subcontractor was adequate to install the electrical grounding rods. The electrical subcontractor installed four grounding rods at a depth of approximately 10 ft. However, the permit issued to the fencing contractor limited the depth of penetrations to 5 ft, and the electrical subcontractor was not included on the permit. (OEWS 98-01 and ORPS Report OH-FN-FDF-FEMP-1997-0061)

These events underscore the importance of using effective work control practices and detailed pre-job planning for construction activities. The responsibility for ensuring adequate planning and control of work activities resides with line management. Managers should ensure that work control processes are followed and facility practices are enforced. Safety and health hazard analysis must be included in the work control process to help prevent worker injury. Pre-job briefings, facility procedures, and training programs should emphasize the dangers associated with excavation and drilling activities. Safety management systems break down when information is not adequate or is not effectively communicated to workers. Managers need to ensure that work instructions clearly define the scope of work to be performed and any protective measures that may apply.

DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, provides guidance for enhancing worker, public, and environmental safety. This standard supports integrated safety management system principles to guide the safe accomplishment of work activities. These principles include (1) line management responsibility for safety, (2) clear roles and responsibilities, (3) competence commensurate with responsibilities, (4) balanced priorities, (5) identification of safety standards and requirements, (6) hazard controls tailored to the work being performed, and (7) operations authorization.

KEYWORDS: hazard analysis, integrated safety management, work planning, work control

FUNCTIONAL AREAS: Hazards and Barrier Analysis, Industrial Safety

4. COMMUNICATION RADIOS NOT CERTIFIED AS INTRINSICALLY SAFE

On June 22, 1999, at the Oak Ridge East Tennessee Technology Park, the DOE facility representative assigned to the Toxic Substances Control Act Incinerator (TSCAI) questioned the intrinsic safety of portable communications radios being used in the tank farm and drum storage area. Intrinsically safe electrical equipment is designed to be incapable of releasing sufficient electrical or thermal energy under normal or abnormal operating conditions to cause ignition of a specific hazardous atmosphere. This location is permitted to store volatile flammable liquids and mixed waste contaminated with polychlorinated biphenyls and is categorized as a Class I, Division 2, Group D, area in accordance with the National Electric Code and the National Fire Protection Association (NFPA). Facility personnel performed a survey of all radios used at TSCAI and discovered one model in use that was not certified as intrinsically safe for a hazardous atmosphere. The TSCAI operations manager immediately issued an order to stop the use of the non-intrinsically-safe radios and to inspect and remove any radios or batteries from service that do not meet intrinsically safe criteria. Facility personnel also discovered that the use of radios not meeting the National Electric Code requirements for Class I, Division 2, Group D, areas was not evaluated within the TSCAI hazard analysis. The use of non-intrinsically-safe electrical equipment in locations where volatile liquids or flammable gases are handled, processed, or used could cause these materials to ignite, creating a fire or explosion. (ORPS Report ORO--BJC-K25WASTMAN-1999-0010)

A Class I, Division 2, location is a location (1) in which volatile flammable liquids or flammable gases are handled, processed, or used, but in which the liquids, vapors, or gases are confined within closed containers or closed systems from which they can escape only in case of accidental rupture or breakdown of the containers or systems or in case of abnormal operation of equipment; (2) in which ignitable concentrations of gases or vapors are normally prevented by positive mechanical ventilation and which might become hazardous through failure or abnormal operation of the ventilating equipment; or (3) that is adjacent to a Class I, Division 1, location and to which ignitable concentrations of gases or vapors might occasionally be communicated unless such communication is prevented by adequate positive-pressure ventilation from a source of clean air and effective safeguards against ventilation failure are provided. Group D atmospheres may contain any of the following: acetone, ammonia, benzene, butane, cyclopropane, ethanol, gasoline, hexane, methanol, methane, natural gas, naphtha, propane, or gases or vapors of equivalent nature.

The TSCAI Auditable Safety Analysis (ASA) requires all field-mounted instrumentation to be intrinsically safe and also requires that non-sparking tools and equipment be used in the tank farm and drum storage area. The types of equipment evaluated in the ASA include field-mounted instruments, electrical equipment, and forklifts, but hand-held radios and similar portable electrical equipment were not evaluated. The DOE facility representative believed that entering those areas with non-intrinsically-safe radios was a violation of or an inadequacy in the ASA. At TSCAI, two types of Motorola communication radios are used: the Saber™ and the MTS 2000™. According to the manufacturer's instructions, intrinsically safe radios are identified by attached certification labels and by matching green dots on the bottom of the radios and their batteries. The Saber™ radio model in use had the certification labels and the matching dots, but the MTS 2000™ radios, shown in Figure 4-1, did not have the proper markings.

Figure 4-1. Motorola MTS 2000

OEAF engineers reviewed the ORPS database for similar occurrences involving inadequate control of ignition sources and found the following events.

- On May 8, 1998, the Flammable Gas Evaluation Advisory Board at the Hanford Site Tank Farms determined that catch-tank leak detectors might not be in compliance with the basis for interim operations controls. Unreviewed safety question screeners determined that the leak detectors did not meet technical safety requirements which called for leak detectors to meet NFPA Class I, Division 2, Group B, standards for ignition sources located in potentially flammable environments. (ORPS Report RL--PHMC-TANKFARM-1998-0049)

- On August 13, 1997, the Flammable Gas Evaluation Advisory Board at the Hanford Site Tank Farms could not verify that flammable gas monitors installed with saltwell pumping equipment met ignition source controls identified in facility safety requirements. The tank farms' operations manager shut down saltwell pumping transfers until the installed monitors could be replaced with monitors that met NFPA requirements for Class I, Division 2, Group B, locations. (ORPS Report RL--PHMC-TANKFARM-1997-0066)

- On February 26, 1997, an engineer at the Hanford Site Waste Sampling and Characterization Facility performing a work package walk-down discovered that raceway conduit fittings associated with a lighting system did not meet NFPA requirements for Class I, Division 2, Groups A, B, and D. Workers isolated power to the lighting system, removed flammable gas cylinders, and replaced the conduit fittings with fittings that met NFPA requirements. (ORPS Report RL--PHMC-WSCF-1997-0002)

- On May 8, 1991, investigators at the Oak Ridge K-25 Site (now known as East Tennessee Technology Park) TSCAI Facility discovered that pressure differential switches and level indicators did not meet NFPA requirements for instruments located in flammable environments. The pressure switches did not meet requirements because conduit seals were not installed when the instruments were replaced. The level indicators did not meet requirements because they were not explosion-proof. (ORPS Report ORO--MMES-K25INCINER-1991-1002)

These events underscore the importance of having administrative controls in place to ensure the proper selection, installation, and use of electrical equipment in hazardous locations. Facility managers should ensure that all fire protection standards are being satisfied. Site managers and supervisors with safety basis documents that establish conditions for the mitigation of hazards associated with flammable materials storage should review their operating conditions and safety documentation to ensure controls are established on the use of electronic equipment such as radios, cellular phones, pagers, and bar-code readers. Equipment installed or used in flammable or explosive environments should be constructed of spark-resistant material, rendered incapable of sparking, or be certified intrinsically safe. Facility supervisors responsible for fire protection, equipment selection, and installation should review the following references.

- National Fire Protection Association, *NFPA 70 – National Electrical Code*, Article 500, “Hazardous Locations,” covers the requirements for electrical and electronic equipment and wiring for all voltages in locations where flammable gases or vapors, flammable liquids, combustible dust, or ignitable fibers or flyings may pose fire or explosion hazards.

- American National Standards Institute, ANSI/UL 913, *Standard for Intrinsically Safe Apparatus and Associated Apparatus for Use in Class I, II, and III, Division 1 Hazardous Locations*, provides construction and performance requirements for intrinsically safe equipment.

Information on ordering NFPA documents can be found at http://www.nfpa.org. DOE fire protection references can be found at http://nattie.eh.doe.gov:80/fire/. Information on ordering ANSI documents can be obtained at the ANSI Catalogs and Standards Information home page at http://web.ansi.org/public/std_info.html.

KEYWORDS: fire protection, explosive, hazard analysis, safety analysis

FUNCTIONAL AREAS: Explosive Safety, Fire Protection

5. SUBCONTRACTOR BREACHES MISIDENTIFIED ACID PIPING

On June 29, 1999, at the Idaho National Engineering and Environmental Laboratory, a plant operator discovered approximately one gallon of liquid on the floor that had spilled from nitric acid supply piping that a subcontractor was working on. The subcontractor had breached the acid pipe because it was marked for removal under his scope of work. However, the piping was misidentified for removal and was an active line. The operator was flushing the acid piping in preparation for transferring nitric acid when the liquid spilled on the floor. Although the spilled liquid was only demineralized water, the loss of configuration control could have resulted in nitric acid being spilled. (ORPS Report ID--LITC-TRA-1999-0016)

Investigators determined that the subcontractor had disconnected a fitting in the acid pipe because it was included in his scope of work and that it had been marked by the operating contractor's engineer with blue spray paint, meaning that it was part of a system that was to be removed. Unknown to the subcontractor, operating contractor managers had decided to retain, but move, parts of the system marked for removal, and that work had been completed by the operating contractor's maintenance organization under a separate work order. Plant personnel cleaned up the spill and reconnected the piping. In response to this event, the site area director issued a partial stop-work order to the subcontractor, stopping any system modification, demolition, and tie-in work until plant personnel can review the system status and prove that it is safe for work to resume.

NFS has reported other events in the Weekly Summary that involved loss of work control. Some examples follow.

- Weekly Summary 99-22 reported that the facility manager designee for the Plutonium Processing and Handling Facility at Los Alamos National Laboratory reported an electrical near miss associated with the replacement of a vacuum pump. Electricians had wired a new control panel for the replacement pump using an existing 480-V ac power source even though the control circuits were designed for 208 V ac. The design change package (DCP) for the work clearly said that no changes to the existing electrical power would be required, and no electrical drawings, which would have shown the 208-V ac requirement for the control circuits, were provided with the DCP. Investigators determined that although the original DCP called for only minor piping modifications to accommodate the different dimensions of the new pump, several field change requests (FCRs) had been submitted in support of the work. One FCR was necessary to modify the pump foundation to support the new pump. The new control system was an afterthought that was also added to the DCP using an FCR. However, the new control panel significantly changed the scope of work, and this change was not addressed by the original unreviewed safety question determination. (ORPS Report ALO-LA-LANL-TA55-1999-0030)

- Weekly Summary 96-17 reported that a contractor at Los Alamos National Laboratory received a mild electrical shock when he cut through an energized 220-V cable during asbestos abatement in the Chemistry and Materials Research facility. This occurrence was a result of mismanagement of two separate contractors' work scopes. Accuracy of the building configuration documentation was a secondary issue. (ORPS Report ALO-LA-LANL-CMR-1996-0016)

These events underscore the importance of using an integrated approach to safety that stresses clear goals and policies, individual and management accountability and ownership, implementation of requirements and procedures, and thorough and systematic management oversight. The responsibility for ensuring adequate planning and control of work activities resides with line management. Managers should ensure that work control processes are followed and facility practices are enforced. Safety and health hazard analyses must be included in the work control process to help prevent worker injury. The hazard analysis process should include provisions for lockouts/tagouts, job-specific walk-downs, integration of work activities, and personal protective equipment. Pre-job briefings, facility procedures, and training programs should emphasize the dangers associated with job-specific activities.

Facility managers should review the following references for guidance on work control and integrated safety management.

- DOE G 450.4-1, *Integrated Safety Management System Guide for Use with DOE P 450.4 Safety Management System Policy,* describes the principles and functions that must be addressed in an effective integrated safety management program. The five core functions of DOE's integrated safety management system are (1) define the scope of work, (2) identify and analyze the work hazards, (3) develop and implement hazard controls, (4) perform work within controls, and (5) provide feedback on the adequacy of controls and continuous improvement in defining and planning work. Integrated safety management information can be found at the Safety Management website, http://tis-nt.eh.doe.gov/ism.

- DOE-STD-1053-93, *Guideline to Good Practices for Control of Maintenance Activities at DOE Nuclear Facilities*, provides extensive guidance for the development of work control plans and the supervision of maintenance activities.

- DOE-STD-1073-93-Pt.1 and -Pt.2*, Guide for Operational Configuration Management Programs, Including the Adjunct Programs of Design Reconstitution and Material Condition and Aging Management*, provides guidelines and good practices for an operational configuration management program including change control and document control.

- DOE-STD-1120-98, *Integration of Environment, Safety, and Health into Facility Disposition Activities*, provides guidance for enhancing worker, public, and environmental safety. This standard supports integrated safety management system principles to guide the safe accomplishment of work activities. These principles include (1) line management responsibility for safety, (2) clear roles and responsibilities, (3) competence commensurate with responsibilities, (4) balanced priorities, (5) identification of safety standards and requirements, (6) hazard controls tailored to work being performed, and (7) operations authorization.

DOE technical standards are available at http://tis.eh.doe.gov/techstds/.

KEYWORDS: acid**,** spill, work planning

FUNCTIONAL AREAS: Industrial Safety, Work Control

6. NRC PROPOSES FINE AGAINST UNITED STATES ENRICHMENT CORPORATION

On June 30, 1999, the Nuclear Regulatory Commission (NRC) Office of Public Affairs for Region III issued a press release stating that it has proposed a $55,000 fine against United States Enrichment Corporation (USEC) for failing to declare an alert under its emergency plan during a fire at the Portsmouth Gaseous Diffusion Plant. On December 9, 1998, a fire damaged equipment in a portion of the plant that is used to remove waste gases from the processing system that processes uranium for use in fuel for commercial nuclear power plants. The fire lasted for about two hours, generating thick smoke and 20-ft flames, while large quantities of oil spilled onto the floor of the building. Four individuals received minor injuries. The fire was contained in the side purge cascade cell in the large processing building. Environmental monitoring by USEC showed no evidence of a release of uranium outside the building. (NRC Office of Public Affairs No. RIII-99-38)

Because USEC failed to declare an alert, the on-site emergency operations facility, which would have provided technical and management support to the response effort, was never activated. As a result, plant personnel took longer to fight the fire and did not take prompt action to control uranium still in the system after the fire was extinguished. The failure to declare an alert also meant that local, state, and federal agencies were not notified of the event or its significance, preventing them from fulfilling their emergency response functions.

USEC took prompt and comprehensive corrective actions following the fire, including revising its emergency procedures and training plant staff. It has until July 29, 1999, to pay the fine or protest it. If the fine is protested but subsequently imposed anyway by the NRC, USEC may request a hearing. NFS reported the results of the NRC's Augmented Inspection Team report on the gaseous diffusion plant fire in Weekly Summary 99-11.

KEYWORDS: emergency, fire, fire protection

FUNCTIONAL AREAS: Emergency Planning, Fire Protection

FINAL REPORT

This section of the OEWS discusses events filed as final reports in the ORPS. These events contain new or additional lessons learned that may be of interest to personnel within the DOE complex.

1. DELINQUENT INSPECTION OF FIRE PROTECTION SYSTEMS

On April 29, 1999, at the Savannah River Site (SRS), the FB-Line facility manager reported that 12 facility fire zones were delinquent in the required scheduled preventive maintenance. The preventive maintenance for these zones was due on January 1, 1999, and had a delinquency date of April 29, 1999. A site manual specifying the fire system requirements stipulates that any system delinquent on inspection shall be considered impaired. Inspectors found two zones to be unimpaired and fully operable on April 27 and 28. They declared the remaining ten delinquent fire zones to be impaired and established hourly fire patrols for specific areas, as per facility procedures. Performing inspections and surveillances on safety systems is important to verify system operability, which is essential to the safe operation of the facility. (ORPS Report SR--WSRC-FBLINE-1999-0013)

Facility managers conducted a critique of this event and identified several other delinquent fire zones. They made appropriate notifications and initiated compensatory measures to ensure fire safety. The managers conducted an in-depth review of the occurrence and determined the direct cause to be a management problem (inadequate administrative control) because the SRS fire systems inspection program does not have adequate checks and balances to preclude missed fire safety surveillances/inspections. They determined the root cause of the event was work organization/planning deficiency.

Westinghouse Savannah River Company (WSRC) initiated an assessment of the overall SRS fire protection system pursuant to the site deficiencies identified in its fire system testing. The purpose of this effort was to identify recurring deficiencies that indicate programmatic or recurring weaknesses. The investigating team, which comprised five cognizant personnel, reviewed similar occurrences, internal assessments, improvement plans, and program deficiency reports. They identified the following recurring deficiencies.

- **Inadequate Fire Protection Configuration Management** — The various system boundaries lack proper technical basis.

- **Fire Protection Maintenance, Testing and Inspection (MT&I)** — Procedures to maintain system operability were not properly followed or controlled per written instructions.

- **Fire Hazard Analysis and Authorization Bases** — Fire hazard analysis is deficient in proper integration with authorization bases, thereby compromising fire safety at the facilities.

- **Erratic Fire Protection MT&I Schedule** — No formal MT&I schedule is in place for performing regular surveillances to ensure continuous operability of the fire protection systems in the facility's various protection zones.

These deficiencies, which collectively represent a programmatic weakness in the SRS fire protection program, were reported to DOE's noncompliance tracking system. WSRC has taken a cost-effective graded approach, using commercial practices applicable to non-nuclear facilities only, to remedy these deficiencies. Because they are safety class/safety significant systems, the fire protection systems at SRS nuclear facilities need additional controls to ensure fire safety.

Two similar, relatively recent occurrences underscore the need for proper administrative control of fire protection systems configuration controls throughout the DOE complex to ensure safe conduct of operations.

- On March 3, 1999, at the Pantex Plant, the facility manager incorrectly updated a facility status board to show that an explosives building's fire suppression system was within its surveillance period. In reality, however, the quarterly surveillance on the system, which was due in January 1999, was delinquent. Investigators determined that the facility manager incorrectly assumed that this building had been surveilled at the same time fire protection systems were surveilled in other buildings. (ORPS Report ALO-AO-MHSM-PANTEX-1999-0019)

- On April 3, 1997, at the Oak Ridge National Laboratory, managers determined that a monthly inspection of the fire protection system for the Radiochemistry Engineering Development Center had not been performed as specified in the operational safety requirements. The managers were conducting their annual surveillance of inspection records to verify compliance when they discovered that fire department personnel had missed the November 1996 inspection. Investigators learned that fire department personnel had established an informal policy for conducting these inspections every 30 days, but not to exceed six weeks. (ORPS Report ORO-ORNL-X10REDC-1997-0002 and Weekly Summary 97-15)

These occurrences highlight the following important lessons learned to enhance fire safety across the DOE complex.

- Devise and implement a proactive configuration management protocol for fire safety at all major facilities.

- Ensure effective communications between administrative and support groups to ensure comprehensive fire protection.

- Establish proper liaison with outside agencies involved in the inspection and testing of DOE's fire protection/prevention systems to ensure timely coordination during surveillances.

- Install appropriate protocols to conduct timely fire safety surveillances and ensure system operability at all times.

KEY WORDS: compliance, fire protection, fire safety, fire watch, inspection, surveillance

FUNCTIONAL AREAS: Fire Protection, Licensing/Compliance